

WE CLAIM:

1. A power module comprising:

at least one power semiconductor device;

a housing element including an opening at one major side thereof;

a lead frame including at least one external lead provided for external

5 connection outside said housing element and a conductive pad integrally connected to said external lead and disposed inside said housing element, said conductive pad having a first open surface area large enough to receive said at least one power semiconductor device and a second open surface opposite said first open surface exposed through said opening in said housing element;

10 a heat sink; and

a thermally conductive but electrically insulating material interposed between and in direct contact with said second open surface of said at least one conductive pad and said heat sink, whereby heat generated by said semiconductor device travels through said conductive pad and said thermally conductive and electrically insulating material and is dissipated by said heat sink.

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2. A power module according to claim 1, wherein said housing element comprise a molded rim surrounding said conductive pad, and said external lead extends from an edge of said conductive pad in the interior of said rim through said rim to the exterior thereof.

3. A power module according to claim 1, wherein said lead frame includes a plurality of said conductive pads each receiving at least one semiconductor device and each connected integrally to a respective external lead extending from an interior of said housing element to an exterior thereof.

4. A power module according to claim 3, wherein at least one of said semiconductor devices is electrically connected to at least another one of said semiconductor device in the interior of said housing element to form a portion of said power circuit.

5. A power module according to claim 3, wherein at least one of said external leads is electrically connectable to a power bus to supply power to said connected semiconductor devices and at least the other one of said external leads is used as an output external connection, further comprising an external lead electrically connected to a common conductive pad disposed within said interior of said housing element and electrically connectable to a common bus, wherein at least one of said power semiconductor devices is electrically connected to said common conductive pad.

6. A power module according to claim 1, wherein said lead frame includes a plurality of isolated conductive pads in addition to said at least one conductive pad each integrally connected to a respective external lead extending to the exterior of said housing element, said plurality of isolated conductive pads being arranged opposite to said at least one conductive pad and having disposed on one major surface thereof a single semiconductor device, and further comprising a number of other semiconductor devices disposed on said at least one conductive pad such that said number of semiconductor devices is equal to the number of semiconductor devices disposed on said isolated conductive pads, and a conductive bar isolated from said at least one conductive pad and said isolated conductive pads, said isolated conductive bar being disposed between said at least one conductive pad and said isolated conductive pads.

7. A power module according to claim 6, wherein said external lead connected to said at least one conductive pad is connectable to a power bus to supply power to said semiconductor devices disposed thereon, said leads connected to said isolated conductive pads serve as output leads and said lead connected to said  
5 conductive bar serves as a connection to the ground.

8. A power module according to claim 7, wherein at least one semiconductor device disposed on said at least one conductive pad is electrically connected to a respective one of said isolated pads by at least one wire bond, and each of said semiconductor devices is connected to said isolated conductive bar by at least one wire bond.

9. A power module according to claim 6, further comprising a plurality of pins each electrically connected to a control electrode of a respective power semiconductor device and extending from an interior of said housing element to an exterior thereof for electrical connection.

10. A power module according to claim 11, wherein a number of said pins are disposed on a first circuit board adjacent said isolated conductive pads and the remaining pins are disposed on a second circuit board adjacent said at least one conductive pad.

11. A power module according to claim 1, further comprising at least one circuit board disposed inside said housing element and including at least one pin electrically connected to a conductive land, said conductive land being electrically connected to the control electrode of said at least one semiconductor device.

12. A power module according to claim 11, further comprising a circuit board disposed over said housing element, wherein said at least one pin extends through said circuit board for connection to a control circuit for controlling the operation of said power semiconductor device.

13. A power module according to claim 6, wherein said external leads connected to said isolated conductive pads extend from one side of said housing element and said external lead connected to said at least one conductive pad and said external lead connected to said isolated conductive bar extend from an opposing side of said housing element.

14. A power module comprising:  
a housing element including an opening at one major side thereof;  
a lead frame including a plurality of isolated conductive pads each integrally connected to a respective external lead extending to the exterior of said housing element, said plurality of isolated conductive pads being arranged opposite to at least one conductive pad and having disposed on one major surface thereof a single semiconductor device, and further comprising a number of semiconductor devices disposed on said at least one conductive pad such that said number of semiconductor devices on said at least one conductive pad is equal to the number of semiconductor devices disposed on said isolated conductive pads; and

a conductive bar isolated from said at least one conductive pad and said isolated conductive pads, said isolated conductive bar being disposed between said at least one conductive pad and said isolated conductive pads;

where all of said pads include a major surface exposed at said opening in said housing element.

15. A power module according to claim 14, further comprising a heat sink;  
and

a thermally conductive but electrically insulating material interposed between  
and in direct contact with said second open surface of said conductive pads at said  
5 opening in said housing element and said heat sink, whereby heat generated by said  
semiconductor devices travels through said conductive pad and said thermally  
conductive and electrically insulating material and is dissipated by said heat sink.

16. A power module according to claim 14, further comprising a plurality of  
pins each electrically connected to a control electrode of a respective power  
semiconductor device and extending from an interior of said housing element to an  
exterior thereof for electrical connection.

17. A power module according to claim 16, wherein a number of said pins  
are disposed on a first circuit board adjacent said isolated conductive pads and the  
remaining pins are disposed on a second circuit board adjacent said at least one  
conductive pad.

18. A power module according to claim 14, wherein said external leads  
connected to said isolated conductive pads extend from one side of said housing  
element and said external lead connected to said at least one conductive pad and said  
external lead connected to said isolated conductive bar extend from an opposing side  
5 of said housing element.

19. A power module according to claim 14, wherein said housing element is  
a rim surrounding said conductive pads.

20. A power module according to claim 15, wherein said conductive pads are supported inside said rim.